CLAIMS:

What is claimed is:

1. An optical window deposition shield for accessing a process space through a deposition shield in a plasma processing system comprising:

a plug configured to provide optical access through said deposition shield, said plug comprises a frontal surface and a perimeter surface;

a flange coupled to said plug and configured to couple said optical window deposition shield to at least one of the deposition shield and a chamber wall of the plasma processing system, said flange comprising a first surface, a second surface, and an edge surface, wherein a portion of said first surface comprises a mating surface; and

a protective barrier coupled to a plurality of exposed surfaces of said optical window deposition shield, wherein the plurality of exposed surfaces comprise said frontal surface of said plug, said perimeter surface of said plug, and said first surface of said flange excluding said mating surface.

2. The optical window deposition shield as recited in claim 1, wherein said optical window deposition shield comprises a plurality of fastening receptors coupled to said first surface of said flange and said second surface of said flange and configured to receive fastening devices in order to couple said optical window deposition shield to the at least one of the deposition shield and the chamber wall.

3. The optical window deposition shield as recited in claim 2, wherein each of said plurality of fastening receptors comprises an entrant region, a through-hole region, an exit through-hole, an interior fastener surface, and a recessed fastener surface.

4. The optical window deposition shield as recited in claim 1, wherein said optical window deposition shield further comprises at least one optical through-hole coupled to said frontal surface of said plug and said second surface of said flange, and configured to couple light through said optical window deposition shield.

5. The optical window deposition shield as recited in claim 4, wherein said each of said at least one optical through-hole comprises an exposed entrant surface and an interior through-hole surface.

6. The optical window deposition shield as recited in claim 5, wherein the plurality of exposed surfaces further comprise said exposed entrant surface of at least one of the at least one optical through-hole.

7. The optical window deposition shield as recited in claim 1, wherein said second surface comprises an anodization layer .

8. The optical window deposition shield as recited in claim 1, wherein said edge surface comprises an anodization layer.

9. The optical window deposition shield as recited in claim 1, wherein said protective barrier comprises a compound containing at least one of a III-column element and a Lanthanon element.

10. The optical window deposition shield as recited in claim 9, wherein said III-column element comprises at least one of Yttrium, Scandium, and Lanthanum.

11. The optical window deposition shield as recited in claim 9, wherein said Lanthanon element comprises at least one of Cerium, Dysprosium, and Europium.

12. The optical window deposition shield as recited in claim 1, wherein said protective barrier comprises at least one of Y_2O_3, Sc_2O_3, Sc_2F_3, YF_3, La_2O_3, CeO_2, Eu_2O_3, and DyO_3.

13. The optical window deposition shield as recited in claim 1, wherein said protective barrier comprises a minimum thickness and said minimum thickness is constant across at least one of the plurality of exposed surfaces.

14. The improved optical window deposition shield as recited in claim 1, wherein said protective barrier comprises a variable thickness and said variable thickness ranging from 0.5 to 500 microns.

15. The improved optical window deposition shield as recited in claim 1, wherein said plurality of exposed surfaces further comprises said mating surface.

16. The improved optical window deposition shield as recited in claim 1, wherein said optical window deposition shield comprises a metal.

17. The improved optical window deposition shield as recited in claim 16, wherein said metal comprises aluminum.

18. The improved optical window deposition shield as recited in claim 1, wherein said optical window deposition shield comprises a rectangular shape.

19. The improved optical window deposition shield as recited in claim 1, wherein said mating surface comprises a metallic surface.

20. A method of producing an optical window deposition shield for a deposition shield in a plasma processing system, said method comprising:

fabricating said optical window deposition shield, wherein said optical window deposition shield comprises a plug configured to provide optical access through said deposition shield, said plug comprises a frontal surface and a perimeter surface, and a flange coupled to said plug and configured to couple said optical window deposition shield to at least one of the deposition shield and a chamber wall of the plasma processing system, said flange comprising a first surface, a second surface, and an edge surface, wherein a portion of said first surface comprises a mating surface; and

forming a protective barrier on exposed surfaces, wherein said exposed surfaces comprise said frontal surface of said insert, said perimeter

surface of said insert, and said first surface of said flange excluding said mating surface.

21. The method as recited in claim 20, said method further comprising:

anodizing said optical window deposition shield to form a surface anodization layer on said optical window deposition shield; and

removing said surface anodization layer on said exposed surfaces.

22. The method as recited in claim 21, wherein said removing comprises at least one of machining, smoothing, polishing, and grinding.

23. The method as recited in claim 20, said method further comprising:

masking said exposed surfaces on said optical window deposition shield to prevent formation of a surface anodization layer;

anodizing said optical window deposition shield to form a surface anodization layer on the unmasked surfaces of said optical window deposition shield; and

unmasking said exposed surfaces.

24. The method as recited in claim 20, wherein said fabricating comprises at least one of machining, coating, masking, unmasking, casting, polishing, forging, and grinding.

25. The method as recited in claim 20, wherein said forming comprises at least one of spraying, heating, and cooling

26. The method as recited in claim 20, said method further comprising smoothing said protective barrier.

27. The method as recited in claim 20, wherein said optical window deposition shield comprises a plurality of fastening receptors coupled to said first surface of said flange and said second surface of said flange and configured to receive fastening devices in order to couple said optical window

deposition shield to the at least one of the deposition shield and the chamber wall.

28. The method as recited in claim 27, wherein each of said plurality of fastening receptors comprises an entrant region, an entrant cavity, an exit through-hole, an interior fastener surface, and a recessed fastener surface.

29. The method as recited in claim 20, wherein said plurality of exposed surfaces further comprises said mating surface.

30. The method as recited in claim 20, wherein said optical window deposition shield comprises a metal.

31. The method as recited in claim 30, wherein said metal comprises aluminum.

32. The method as recited in claim 20, wherein said optical window deposition shield comprises a rectangular shape.

33. The method as recited in claim 20, wherein said second surface comprises an anodization layer.

34. The method as recited in claim 20, wherein said edge surface comprises an anodization layer.

35. The method as recited in claim 20, wherein said protective barrier comprises a compound containing at least one of a III-column element and a Lanthanon element.

36. The method as recited in claim 35, wherein said III-column element comprises at least one of Yttrium, Scandium, and Lanthanum.

37. The method as recited in claim 35, wherein said Lanthanon element comprises at least one of Cerium, Dysprosium, and Europium.

38. The method as recited in claim 20, wherein said protective barrier comprises at least one of Y_2O_3, Sc_2O_3, Sc_2F_3, YF_3, La_2O_3, CeO_2, Eu_2O_3, and DyO_3.

39. The method as recited in claim 20, wherein said protective barrier comprises a minimum thickness and said minimum thickness is constant across at least one of said exposed surfaces.

40. The method as recited in claim 20, wherein said protective barrier comprises a variable thickness and said variable thickness ranging from 0.5 to 500 microns.

41. An insert for a deposition shield in a plasma processing system comprising:

a plug configured to fit into an opening in said deposition shield, said plug comprises a frontal surface and a perimeter surface;

a flange coupled to said plug and configured to couple said insert to at least one of the deposition shield and a chamber wall of the plasma processing system, said flange comprising a first surface, a second surface, and an edge surface, wherein a portion of said first surface comprises a mating surface; and

a protective barrier coupled to a plurality of exposed surfaces of said insert, wherein the plurality of exposed surfaces comprise said frontal surface of said plug, said perimeter surface of said plug, and said first surface of said flange excluding said mating surface.

42. The insert as recited in claim 41, wherein said insert comprises a plurality of fastening receptors coupled to said first surface of said flange and said second surface of said flange and configured to receive fastening devices in order to couple said insert to the at least one of the deposition shield and the chamber wall.

43. The insert as recited in claim 42, wherein each of said plurality of fastening receptors comprises an entrant region, an entrant cavity, an exit through-hole, an interior fastener surface, and a recessed fastener surface.

44. The insert as recited in claim 41, wherein said plurality of exposed surfaces further comprises said mating surface.

45. The insert as recited in claim 41, wherein said insert comprises a metal.

46. The insert as recited in claim 45, wherein said metal comprises aluminum.

47. The insert as recited in claim 41, wherein said insert comprises a rectangular shape.

48. The insert as recited in claim 41, wherein said protective barrier comprises Al_2O_3.

49. The insert as recited in claim 41, wherein said protective barrier comprises a mixture of Al_2O_3 and Y_2O_3.

50. The insert as recited in claim 41, wherein said protective barrier comprises a compound containing at least one of a III-column element and a Lanthanon element.

51. The insert as recited in claim 50, wherein said III-column element comprises at least one of Yttrium, Scandium, and Lanthanum.

52. The insert as recited in claim 50, wherein said Lanthanon element comprises at least one of Cerium, Dysprosium, and Europium.

53. The insert as recited in claim 41, wherein said protective barrier comprises at least one of Yttria (Y_2O_3), Sc_2O_3, Sc_2F_3, YF_3, La_2O_3, CeO_2, Eu_2O_3, and DyO_3.

54. The insert as recited in claim 41, wherein said protective barrier comprises a minimum thickness and said minimum thickness is constant across at least one of said exposed surfaces.

55. The insert as recited in claim 41, wherein said protective barrier comprises a variable thickness and said variable thickness ranging from 0.5 to 500 microns.

56. The insert as recited in claim 41, wherein said plurality of exposed surfaces further comprise said interior fastener surface.

57. A method of producing an insert for a deposition shield in a plasma processing system, said method comprising:

fabricating said insert, wherein said insert comprises a plug configured to fit into an opening in said deposition shield, said plug comprises a frontal surface and a perimeter surface and a flange coupled to said plug and configured to couple said insert to at least one of the deposition shield and a chamber wall of the plasma processing system, said flange comprising a first surface, a second surface, and an edge surface, wherein a portion of said first surface comprises a mating surface; and

forming a protective barrier on exposed surfaces, wherein said exposed surfaces comprise said frontal surface of said plug, said perimeter surface of said plug, and said first surface of said flange excluding said mating surface.

58. The method as recited in claim 57, said method further comprising:

anodizing said insert to form a surface anodization layer on said insert; and

removing said surface anodization layer on said exposed surfaces.

59. The method as recited in claim 58, wherein said removing comprises at least one of machining, smoothing, polishing, and grinding.

60. The method as recited in claim 57, said method further comprising:

masking said exposed surfaces on said insert to prevent formation of a surface anodization layer;

anodizing said insert to form a surface anodization layer on the unmasked surfaces of said insert; and

unmasking said exposed surfaces.

61. The method as recited in claim 57, wherein said fabricating comprises at least one of machining, coating, masking, unmasking, casting, polishing, forging, and grinding.

62. The method as recited in claim 57, wherein said forming comprises at least one of spraying, heating, and cooling

63. The method as recited in claim 57, said method further comprising smoothing said protective barrier.

64. The method as recited in claim 57, wherein said insert comprises a plurality of fastening receptors coupled to said first surface of said flange and said second surface of said flange and configured to receive fastening devices in order to couple said insert to the at least one of the deposition shield and the chamber wall.

65. The method as recited in claim 64, wherein each of said plurality of fastening receptors comprises an entrant region, an entrant cavity, an exit through-hole, an interior fastener surface, and a recessed fastener surface.

66. The method as recited in claim 57, wherein said plurality of exposed surfaces further comprises said mating surface.

67. The method as recited in claim 57, wherein said insert comprises a metal.

68. The method as recited in claim 67, wherein said metal comprises aluminum.

69. The method as recited in claim 57, wherein said insert comprises a rectangular shape.

70. The method as recited in claim 57, wherein said protective barrier comprises Al_2O_3.

71. The method as recited in claim 57, wherein said protective barrier comprises Al_2O_3 and Y_2O_3.

72. The method as recited in claim 57, wherein said protective barrier comprises a compound containing at least one of a III-column element and a Lanthanon element.

73. The method as recited in claim 72, wherein said III-column element comprises at least one of Yttrium, Scandium, and Lanthanum.

74. The method as recited in claim 72, wherein said Lanthanon element comprises at least one of Cerium, Dysprosium, and Europium.

75. The method as recited in claim 57, wherein said protective barrier comprises at least one of Yttria (Y_2O_3), Sc_2O_3, Sc_2F_3, YF_3, La_2O_3, CeO_2, Eu_2O_3, and DyO_3.

76. The method as recited in claim 57, wherein said protective barrier comprises a minimum thickness and said minimum thickness is constant across at least one of said exposed surfaces.

77. The method as recited in claim 57, wherein said protective barrier comprises a variable thickness and said variable thickness ranging from 0.5 to 500 microns.

78. A method of producing an optical window deposition shield for accessing a process space through a deposition shield in a plasma processing system, said method comprising the steps:

fabricating said optical window deposition shield, said optical window deposition shield comprising a plug, said plug comprises a frontal surface and a perimeter surface, and a flange coupled to said plug, said flange comprises a first surface, a second surface, and an edge surface, wherein a portion of said first surface comprises a mating surface;

anodizing said optical window deposition shield to form a surface anodization layer on said optical window deposition shield;

machining exposed surfaces on said optical window deposition shield to remove said surface anodization layer, said exposed surfaces comprising said frontal surface of said plug, said perimeter surface of said plug, and said first surface of said flange excluding said mating surface; and

forming a protective barrier on the exposed surfaces.

79. The method as recited in claim 78, wherein said protective barrier comprises a compound containing at least one of a III-column element and a Lanthanon element.

80. The method as recited in claim 78, wherein said protective barrier comprises at least one of Yttria (Y_2O_3), Sc_2O_3, Sc_2F_3, YF_3, La_2O_3, CeO_2, Eu_2O_3, and DyO_3.

81. A method of producing an improved optical window deposition shield for accessing a process space through a deposition shield in a plasma processing system, said method comprising the steps:

fabricating said optical window deposition shield, said optical window deposition shield comprising a plug, said plug comprises a frontal surface and a perimeter surface, and a flange coupled to said plug, said flange comprises

a first surface, a second surface, and an edge surface, wherein a portion of said first surface comprises a mating surface;

masking exposed surfaces on said optical window deposition shield to prevent formation of a surface anodization layer, said exposed surfaces comprising said frontal surface of said plug, said perimeter surface of said plug, and said first surface of said flange excluding said mating surface;

anodizing said optical window deposition shield to form a surface anodization layer on said optical window deposition shield;

unmasking the exposed surfaces; and

forming a protective barrier on the exposed surfaces.

82. The method as recited in claim 81, wherein said protective barrier comprises a compound containing at least one of a III-column element and a Lanthanon element.

83. The method as recited in claim 81, wherein said protective barrier comprises at least one of Y_2O_3, Sc_2O_3, Sc_2F_3, YF_3, La_2O_3, CeO_2, Eu_2O_3, and DyO_3.

84. The method as recited in claim 78, further comprising machining at least one unexposed surface to produce a bare mating surface.